OK to enter SUBSTITUTE Spec filed 01 MAR 2004 Stanley T. Pemberton 12 March

MICROMACHINED PYRO-OPTICAL STRUCTURE

Technical field of the invention

[0001] This invention relates generally to thermal sensing of low-level radiation of infrared or millimeter wavelengths and more particularly to a pyro-optical pixel structure and focal plane array with means for maintaining a nominal temperature. This invention describes a method of sensing incident radiation using a highly sensitive thermal thin film structure. In its embodiment as an array, a thermal image obtained typically from infrared wavelengths is interrogated using an optical carrier beam and readout with conventional CCD or CMOS silicon imagers.

[0002] **Cross reference to related applications:** This application was originally filed as 60/249721 dated Nov 20, 2000 with the US Patent and Trademark Office.

[0003] **Statement regarding federally sponsored R&D:** Work leading to this invention was not funded by the US Government

Background of the invention:

[0004] Thermal-based sensor systems typically use a pixel that is highly sensitive to temperature differentials. This minute temperature differential is read out using conversion techniques into an electrical signal. The basic components for a thermal imaging system generally include optics for collecting and focusing the incident irradiation from a scene onto an imaging focal plane. A chopper is often included in a thermal imaging system to produce a constant background radiance which provides a reference signal. The electronic processing portion of the thermal imaging system will subtract the reference signal from the total radiance signal to produce an output signal with a minimum background noise level.

[0005] The concept of using a pyro-optical material as a sensor to detect radiation by modulating a carrier beam was first disclosed by Elliott in US Patent 4,594,507. This concept is cited as prior art in Fig. 1 as an architectural representation of a system with an optical carrier source 1 and an external radiation source 2 illuminating a pyro-optical pixel 3 with a photodetector 4 to monitor the amplitude of the carrier source 2 modulated by the transmissivity of the pyro-optical pixel 3. In this example the low level radiation source is focused onto the pyro-optical plane 3 through refractory lens 5. The present invention is an improved sensor pixel based on the concept of Fig. 1. The present invention describes a